

Remarks

The Office Action mailed April 18, 2005 has been carefully reviewed and the following remarks have been made in consequence thereof.

Claims 1-21 are now pending in this application. Claims 4-9 and 14-19 are withdrawn from consideration. Claims 1-3, 10-13, and 20 are rejected. Claim 21 is newly added. Claims 1, 10, 11, and 20 have been amended. No new matter has been added. A fee calculation sheet is submitted herewith for the newly added Claim 21.

A restriction to one of species I, consisting of Claims 1-3, 10-13, and 20, and species II, consisting of Claims 4-9 and 14-19, has been imposed. In response to the restriction requirement set forth in the Office Action, Applicants elect, with traverse, for prosecution in this application Claims 1-3, 10-13, and 20 of species I.

The restriction requirement is respectfully traversed because the inventions set out by the claims in species I and II clearly are related. Applicants respectfully submit that it is evident that the claims of species I and II have an overlapping nature such that a search and examination of species I and II can be made without serious burden. MPEP section 803 states that if “the search and examination of an entire application can be made without serious burden, the examiner must examine it on the merits, even though it includes claims to independent or distinct inventions”. Indeed, there is a lack of showing that the cited claim species are not encompassed by a single class and a single subclass, and it is not evident how the searching of Claims 1-20 could present an unreasonable burden on the Examiner. Because there is a lack of showing that the cited claim species are not encompassed by a single class and a single subclass, the restriction requirement is submitted to be unsupportable on the present record. Therefore, it is respectfully submitted that the restriction requirement is improper and should be withdrawn.

Applicant respectfully submits that a thorough search and examination of either claim species would be relevant to the examination of the other species. In addition, requirements for restriction are not mandatory under 35 U.S.C. §121. Accordingly, reconsideration of the restriction requirement is requested.

The objection to the drawings is respectfully traversed. Figures 4 and 5 have amended. Accordingly, Applicants respectfully request that the objection to the drawings be withdrawn.

The objection to the specification is respectfully traversed. The statement, in the Office Action, that ‘m’ should be replaced by ‘y’ is respectfully traversed. Applicants submit that if m is replaced by y in paragraph 31, line 7 of the specification, the specification will state that y is a real number greater than zero twice. Paragraph 31, lines 2-7, of the specification states, “As an example, a radius of curvature of detector array 18 at a point 130 is $x+y$ centimeters (cm), where x is a radius of curvature of collimator 122 at a distance 132 from focal point 60, and where x and y are real numbers greater than zero. In this example, a radius of curvature of detector array 18 at a point 134 is $m+y$ cm, where m is a radius of curvature of collimator 122 at a distance 136 from focal point 60, and where m is a real number greater than zero.” If m is replaced by y in paragraph 31, line 7 of the specification, the specification will state that y is a real number greater than zero twice in lines 4-5 and line 7 of paragraph 31 of the specification. Accordingly, Applicants respectfully submit that there is no need to redundantly state y is a real number greater than zero twice in the specification and request that the objection regarding replacing m by y be withdrawn.

Paragraph 35 has been amended. Accordingly, Applicants respectfully request that the objection to the specification be withdrawn.

The rejection of Claims 1, 2, 11, 12, and 20 under 35 U.S.C. § 102(b) as being anticipated by Hoffman et al. (U.S. Patent No. 5,799,057) is respectfully traversed.

Hoffman et al. describe a scatter collimator that includes a housing (column 2, lines 61-65). A plurality of substantially parallel attenuating blades and a plurality of substantially parallel attenuating wires are located in the housing (column 2, lines 61-65). A detector array includes a plurality of detector elements, and is configured to attach to the housing (column 3, lines 10-11).

Claim 1 recites an imaging system comprising “a radiation source configured to generate a beam; a pre-patient collimator configured to collimate the beam to

generate a collimated beam; and a detector configured to detect the collimated beam, wherein the pre-patient collimator is configured to reduce a curvature of an x-ray beam profile formed on the detector, and the pre-patient collimator is one of: a first collimator with a curved contour proportional to a contour of the detector; a second collimator with blades, wherein slopes of two oppositely-facing surfaces of at least one of said blades are different from each other; and a third collimator having at least two sets of plates, wherein said plates in a set pivot with respect to each other.”

Hoffman et al. do not describe or suggest an imaging system as recited in Claim 1. Specifically, Hoffman et al. do not describe or suggest a pre-patient collimator configured to collimate the beam to generate a collimated beam, where the pre-patient collimator is configured to reduce a curvature of an x-ray beam profile formed on the detector. Rather, Hoffman et al. describe a scatter collimator that includes a housing to which a detector array is attached and in which a plurality of substantially parallel attenuating blades and a plurality of substantially parallel attenuating wires are located. A description of the scatter collimator that includes a housing to which a detector array is attached as described in Hoffman et al. does not describe or suggest a pre-patient collimator recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Hoffman et al.

Claim 2 depends from independent Claim 1. When the recitations of Claim 2 are considered in combination with the recitations of Claim 1, Applicants submit that Claim 2 likewise is patentable over Hoffman et al.

Claim 11 recites a computed tomography imaging system comprising “an x-ray source configured to generate a beam; a pre-patient collimator configured to collimate the x-ray beam to generate a collimated x-ray beam; and a detector configured to detect the collimated x-ray beam, wherein the pre-patient collimator is configured to reduce a curvature of an x-ray beam profile formed on the detector, and the pre-patient collimator is one of: a first collimator with a curved contour proportional to a contour of the detector; a second collimator with blades, wherein slopes of two oppositely-facing surfaces of at least one of said blades are different from each other; and a third collimator having at least two sets of plates, wherein said plates in a set pivot with respect to each other.”

Hoffman et al. do not describe or suggest a computed tomography imaging system as recited in Claim 11. Specifically, Hoffman et al. do not describe or suggest a pre-patient collimator configured to collimate the x-ray beam to generate a collimated x-ray beam, where the pre-patient collimator is configured to reduce a curvature of an x-ray beam profile formed on the detector. Rather, Hoffman et al. describe a scatter collimator that includes a housing to which a detector array is attached and in which a plurality of substantially parallel attenuating blades and a plurality of substantially parallel attenuating wires are located. A description of the scatter collimator that includes a housing to which a detector array is attached as described in Hoffman et al. does not describe or suggest a pre-patient collimator recited in Claim 11. For the reasons set forth above, Claim 11 is submitted to be patentable over Hoffman et al.

Claim 12 depends from independent Claim 11. When the recitations of Claim 12 are considered in combination with the recitations of Claim 11, Applicants submit that Claim 12 likewise is patentable over Hoffman et al.

Claim 20 recites a method for reducing dosage of radiation incident on a subject, the method comprising “transmitting a beam of radiation toward the subject; collimating the beam of radiation before the beam reaches the subject; detecting, by a detector, the collimated beam of radiation, wherein the collimating is performed by one of: a first collimator with a curved contour proportional to a contour of a detector that detects the collimated beam; a second collimator with blades, wherein slopes of two oppositely-facing surfaces of at least one of said blades are different from each other; and a third collimator having at least two sets of plates, wherein said plates in a set pivot with respect to each other; and reducing a curvature of an x-ray beam profile formed on the detector by performing the collimating the beam of radiation.”

Hoffman et al. do not describe or suggest a method for reducing dosage of radiation as recited in Claim 20. Specifically, Hoffman et al. do not describe or suggest collimating the beam of radiation before the beam reaches the subject, and reducing a curvature of an x-ray beam profile formed on the detector by performing the collimating the beam of radiation. Rather, Hoffman et al. describe a scatter collimator that includes a housing to which a detector array is attached and in which a

plurality of substantially parallel attenuating blades and a plurality of substantially parallel attenuating wires are located. A description of the scatter collimator that includes a housing to which a detector array is attached as described in Hoffman et al. does not describe or suggest collimating the beam of radiation before the beam reaches the subject recited in Claim 20. For the reasons set forth above, Claim 20 is submitted to be patentable over Hoffman et al.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1, 2, 11, 12, and 20 be withdrawn.

The rejection of Claims 1, 2, 10-12, and 20 under 35 U.S.C. § 102(b) as being anticipated by Swerdloff et al. (U.S. Patent No. 5,317,616) is respectfully traversed.

Swerdloff et al. describe a system in which a conical beam (14') is collimated by a radiation opaque mask (16) constructed of a set of rectangular collimator blades to form a generally planar fan beam (14) centered about a fan beam plane (20) (column 4, lines 50-54). Each leaf (30) of a compensator (22) centered in the fan beam may slide completely within its corresponding sleeve (24) to block a ray (28) associated with that sleeve (column 5, lines 9-11). When the leaf blocks its corresponding ray (28), it is referred to as being in a "closed state" (column 5, lines 11-12). The sleeves are of ample length to permit each leaf to slide out of the path of the fan beam, so as to leave its corresponding ray (28) completely unobstructed, and yet to still be guided by the sleeve (column 5, lines 13-16). In this non-blocking position, a leaf is referred to as being in the "open state" (column 5, lines 16-18).

Claim 1 recites an imaging system comprising "a radiation source configured to generate a beam; a pre-patient collimator configured to collimate the beam to generate a collimated beam; and a detector configured to detect the collimated beam, wherein the pre-patient collimator is configured to reduce a curvature of an x-ray beam profile formed on the detector, and the pre-patient collimator is one of: a first collimator with a curved contour proportional to a contour of the detector; a second collimator with blades, wherein slopes of two oppositely-facing surfaces of at least one of said blades are different from each other; and a third collimator having at least two sets of plates, wherein said plates in a set pivot with respect to each other."

Swerdloff et al. do not describe or suggest an imaging system as recited in Claim 1. Specifically, Swerdloff et al. do not describe or suggest a pre-patient collimator configured to reduce a curvature of an x-ray beam profile formed on the detector. Rather, Swerdloff et al. describe a radiation opaque mask constructed of a set of rectangular collimator blades to form a generally planar fan beam centered about a fan beam plane. Swerdloff et al. further describe a leaf of a compensator centered in the fan beam. The leaf may slide completely within its corresponding sleeve to block a ray associated with that sleeve. A description of the radiation opaque mask and the compensator as described in Swerdloff et al. does not describe or suggest a pre-patient collimator configured to reduce a curvature as recited in Claim 1. For the reasons set forth above, Claim 1 is submitted to be patentable over Swerdloff et al.

Claims 2 and 10 depend from independent Claim 1. When the recitations of Claims 2 and 10 are considered in combination with the recitations of Claim 1, Applicants submit that Claims 2 and 10 likewise is patentable over Swerdloff et al.

Claim 11 recites a computed tomography imaging system comprising “an x-ray source configured to generate a beam; a pre-patient collimator configured to collimate the x-ray beam to generate a collimated x-ray beam; and a detector configured to detect the collimated x-ray beam, wherein the pre-patient collimator is configured to reduce a curvature of an x-ray beam profile formed on the detector, and the pre-patient collimator is one of: a first collimator with a curved contour proportional to a contour of the detector; a second collimator with blades, wherein slopes of two oppositely-facing surfaces of at least one of said blades are different from each other; and a third collimator having at least two sets of plates, wherein said plates in a set pivot with respect to each other.”

Swerdloff et al. do not describe or suggest a computed tomography imaging system as recited in Claim 11. Specifically, Swerdloff et al. do not describe or suggest a pre-patient collimator configured to reduce a curvature of an x-ray beam profile formed on the detector. Rather, Swerdloff et al. describe a radiation opaque mask constructed of a set of rectangular collimator blades to form a generally planar fan beam centered about a fan beam plane. Swerdloff et al. further describe a leaf of a

compensator centered in the fan beam. The leaf may slide completely within its corresponding sleeve to block a ray associated with that sleeve. A description of the radiation opaque mask and the compensator as described in Swerdloff et al. does not describe or suggest a pre-patient collimator configured to reduce a curvature as recited in Claim 11. For the reasons set forth above, Claim 11 is submitted to be patentable over Swerdloff et al.

Claim 12 depends from independent Claim 11. When the recitations of Claim 12 are considered in combination with the recitations of Claim 11, Applicants submit that Claim 12 likewise is patentable over Swerdloff et al.

Claim 20 recites a method for reducing dosage of radiation incident on a subject, the method comprising “transmitting a beam of radiation toward the subject; collimating the beam of radiation before the beam reaches the subject; detecting, by a detector, the collimated beam of radiation, wherein the collimating is performed by one of: a first collimator with a curved contour proportional to a contour of a detector that detects the collimated beam; a second collimator with blades, wherein slopes of two oppositely-facing surfaces of at least one of said blades are different from each other; and a third collimator having at least two sets of plates, wherein said plates in a set pivot with respect to each other; and reducing a curvature of an x-ray beam profile formed on the detector by performing the collimating the beam of radiation.”

Swerdloff et al. do not describe or suggest a method for reducing dosage of radiation as recited in Claim 20. Specifically, Swerdloff et al. do not describe or suggest reducing a curvature of an x-ray beam profile formed on the detector by performing the collimating the beam of radiation. Rather, Swerdloff et al. describe a radiation opaque mask constructed of a set of rectangular collimator blades to form a generally planar fan beam centered about a fan beam plane. Swerdloff et al. further describe a leaf of a compensator centered in the fan beam. The leaf may slide completely within its corresponding sleeve to block a ray associated with that sleeve. A description of the radiation opaque mask and the compensator as described in Swerdloff et al. does not describe or suggest reducing a curvature of an x-ray beam profile formed on the detector by performing the collimating as recited in Claim 20.

For the reasons set forth above, Claim 20 is submitted to be patentable over Swerdloff et al.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1, 2, 10-12, and 20 be withdrawn.

The rejection of Claims 3 and 13 under 35 U.S.C. § 103(a) as being unpatentable over Swerdloff et al. in view of Okazaki (U.S. Patent 5,801,939) is respectfully traversed.

Swerdloff et al. is described above. Okazaki et al. describe a system including a coarse positioner displaced by a first adjusted command signal (column 5, lines 32-33). The system further includes a fine positioner displaced together with the coarse positioner by a second adjusted command signal and having a smaller range of displacement but a higher positioning resolution than the coarse positioner (column 5, lines 34-37).

Claim 3 depends from independent Claim 1 which recites an imaging system comprising “a radiation source configured to generate a beam; a pre-patient collimator configured to collimate the beam to generate a collimated beam; and a detector configured to detect the collimated beam, wherein the pre-patient collimator is configured to reduce a curvature of an x-ray beam profile formed on the detector, and the pre-patient collimator is one of: a first collimator with a curved contour proportional to a contour of the detector; a second collimator with blades, wherein slopes of two oppositely-facing surfaces of at least one of said blades are different from each other; and a third collimator having at least two sets of plates, wherein said plates in a set pivot with respect to each other.”

Neither Swerdloff et al. nor Okazaki et al., considered alone or in combination, describe or suggest an imaging system as recited in Claim 1. Specifically, neither Swerdloff et al. nor Okazaki et al., considered alone or in combination, describe or suggest a pre-patient collimator configured to reduce a curvature of an x-ray beam profile formed on the detector. Rather, Swerdloff et al. describe a radiation opaque mask constructed of a set of rectangular collimator blades to form a generally planar fan beam centered about a fan beam plane. Swerdloff et al.

further describe a leaf of a compensator centered in the fan beam. The leaf may slide completely within its corresponding sleeve to block a ray associated with that sleeve. A description of the radiation opaque mask and the compensator as described in Swerdloff et al. does not describe or suggest a pre-patient collimator configured to reduce a curvature as recited in Claim 1. Okazaki et al. describe a coarse positioner displaced by a first adjusted command signal. Okazaki et al. further describe a fine positioner displaced together with the coarse positioner by a second adjusted command signal and having a smaller range of displacement but a higher positioning resolution than the coarse positioner. Accordingly, neither Swerdloff et al. nor Okazaki et al., considered alone or in combination, describe or suggest a pre-patient collimator configured to reduce a curvature of an x-ray beam profile formed on the detector. For the reasons set forth above, Claim 1 is submitted to be patentable over Swerdloff et al. in view of Okazaki et al.

When the recitations of Claim 3 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claim 3 likewise is patentable over Swerdloff et al. in view of Okazaki et al.

Claim 13 depends from independent Claim 11 which recites a computed tomography imaging system comprising “an x-ray source configured to generate a beam; a pre-patient collimator configured to collimate the x-ray beam to generate a collimated x-ray beam; and a detector configured to detect the collimated x-ray beam, wherein the pre-patient collimator is configured to reduce a curvature of an x-ray beam profile formed on the detector, and the pre-patient collimator is one of: a first collimator with a curved contour proportional to a contour of the detector; a second collimator with blades, wherein slopes of two oppositely-facing surfaces of at least one of said blades are different from each other; and a third collimator having at least two sets of plates, wherein said plates in a set pivot with respect to each other.”

Neither Swerdloff et al. nor Okazaki et al., considered alone or in combination, describe or suggest a computed tomography imaging system as recited in Claim 11. Specifically, neither Swerdloff et al. nor Okazaki et al., considered alone or in combination, describe or suggest a pre-patient collimator configured to reduce a curvature of an x-ray beam profile formed on the detector. Rather, Swerdloff et al.

describe a radiation opaque mask constructed of a set of rectangular collimator blades to form a generally planar fan beam centered about a fan beam plane. Swerdloff et al. further describe a leaf of a compensator centered in the fan beam. The leaf may slide completely within its corresponding sleeve to block a ray associated with that sleeve. A description of the radiation opaque mask and the compensator as described in Swerdloff et al. does not describe or suggest a pre-patient collimator configured to reduce a curvature as recited in Claim 11. Okazaki et al. describe a coarse positioner displaced by a first adjusted command signal. Okazaki et al. further describe a fine positioner displaced together with the coarse positioner by a second adjusted command signal and having a smaller range of displacement but a higher positioning resolution than the coarse positioner. Accordingly, neither Swerdloff et al. nor Okazaki et al., considered alone or in combination, describe or suggest a pre-patient collimator configured to reduce a curvature of an x-ray beam profile formed on the detector. For the reasons set forth above, Claim 11 is submitted to be patentable over Swerdloff et al. in view of Okazaki et al.

When the recitations of Claim 13 are considered in combination with the recitations of Claim 11, Applicants submit that dependent Claim 13 likewise is patentable over Swerdloff et al. in view of Okazaki et al.

For at least the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 3 and 13 be withdrawn.

Moreover, Applicants respectfully submit that the Section 103 rejection of Claims 3 and 13 is not a proper rejection. As is well established, obviousness cannot be established by combining the teachings of the cited art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination. Neither Swerdloff et al. nor Okazaki et al., considered alone or in combination, describe or suggest the claimed combination. Furthermore, in contrast to the assertion within the Office Action, Applicants respectfully submit that it would not be obvious to one skilled in the art to combine Swerdloff et al. with Okazaki et al. because there is no motivation to combine the references suggested in the cited art itself.

As the Federal Circuit has recognized, obviousness is not established merely by combining references having different individual elements of pending claims. *Ex parte Levengood*, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. & Inter. 1993). MPEP 2143.01. Rather, there must be some suggestion, outside of Applicants' disclosure, in the prior art to combine such references, and a reasonable expectation of success must be both found in the prior art, and not based on Applicants' disclosure. *In re Vaeck*, 20 U.S.P.Q.2d 1436 (Fed. Cir. 1991). In the present case, neither a suggestion or motivation to combine the prior art disclosures, nor any reasonable expectation of success has been shown.

Furthermore, it is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the cited art so that the claimed invention is rendered obvious. Specifically, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the art to deprecate the claimed invention. Further, it is impermissible to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. The present Section 103 rejection is based on a combination of teachings selected from multiple patents in an attempt to arrive at the claimed invention. Specifically, Swerdloff et al. teach a radiation opaque mask constructed of a set of rectangular collimator blades to form a generally planar fan beam centered about a fan beam plane. Swerdloff et al. further teach a leaf of a compensator centered in the fan beam. The leaf may slide completely within its corresponding sleeve to block a ray associated with that sleeve. Okazaki et al. teach a coarse positioner displaced by a first adjusted command signal. Okazaki et al. further teach a fine positioner displaced together with the coarse positioner by a second adjusted command signal and having a smaller range of displacement but a higher positioning resolution than the coarse positioner. Since there is no teaching nor suggestion in the cited art for the combination, the Section 103 rejection appears to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicants request that the Section 103 rejections of Claims 3 and 13 be withdrawn.

For at least the reasons set forth above, Applicants respectfully request that the rejections of Claims 3 and 13 under 35 U.S.C. 103(a) be withdrawn.

Newly added Claim 21 depends from independent Claim 1, which is submitted to be in condition for allowance and is patentable over the cited art. For at least the reasons set forth above, Applicants respectfully submit that Claim 21 is also patentable over the cited art.

In view of the foregoing amendment and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,



William J. Zychlewicz
Registration No. 51,366
ARMSTRONG TEASDALE LLP
One Metropolitan Square, Suite 2600
St. Louis, Missouri 63102-2740
(314) 621-5070

IN THE DRAWINGS

Applicant respectfully requests approval of the following drawing changes.

Please cancel current Figure 4. Current Figure 5 has been amended to change the current Figure 5 to a new Figure 4 and to designate collimator 122. Please also add a new Figure 5. Applicants submit replacement drawing sheets incorporating the changes to the current Figure 5 and adding the new Figure 5. No new matter has been added.



4/6

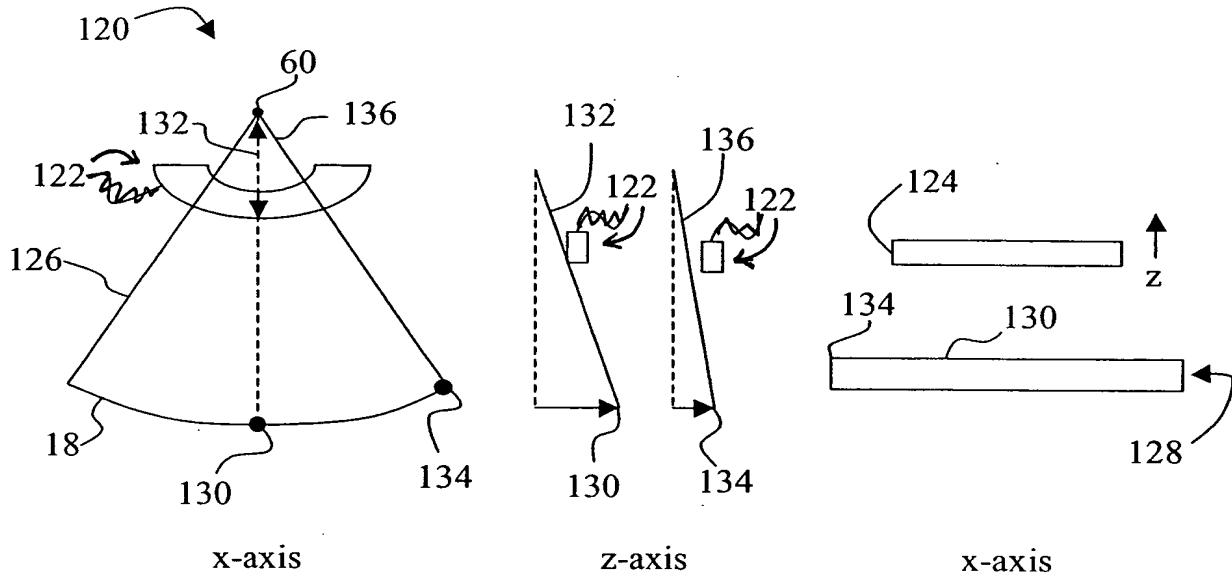


FIG. § 4